



Human Systems Priority Steering Council

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New NDIA Division HUMAN SYSTEMS



Mission

To promote the exchange of technical information and discussions between government, industry, and academia, and the expansion of research and development in areas related to the human as a system whose performance must be integrated into any system of systems

Objectives

- Advocate human-centered research and the integration of cognitive and biological technologies
- Promote discussions to make the “human factor” a top priority in Research, Development, Test and Evaluation (RDT&E)
- Conduct studies and prepare reports in response to requests from the DoD HS Community of Interest (Col)
- Advocate, lead, and influence increased discussion and research on the elements of human-system integration (HSI) domains

Chair: Dr. Greg Zacharias, Charles River Assoc



Human Systems Overall Scope

System Interfaces

Strategic Decisionmaking

Tactical Decision Support

Autonomous vehicle control

Cyber Operations &
Trust

Adaptive Planning



Personnel & Training

Adaptive, tailored instruction

Live, Virtual, Constructive simulation

Realistic immersive training

Train Partner State
Forces



Social & Cultural Understanding

Information sharing w/ partners

Cultural situation awareness

Cultural & language expertise

Social Network
Analysis

Cultural impact of
actions



Protection & Sustainment

Extreme environment protection

Physical Performance Enhancement

Autonomous augmentation

Physical Aiding

Extended Combat
Rations





Human Systems Priority Steering Council FY13-17 Priority S&T



System Interfaces

Strategic Decisionmaking
Tactical Decision Support
Autonomous vehicle control
Cyber Operations & Trust
Adaptive Planning



Personnel & Training

Adaptive, tailored instruction
Live, Virtual, Constructive simulation
Realistic immersive training
Train Partner State Forces



Major Focus of PSC



Human Systems Training for Readiness



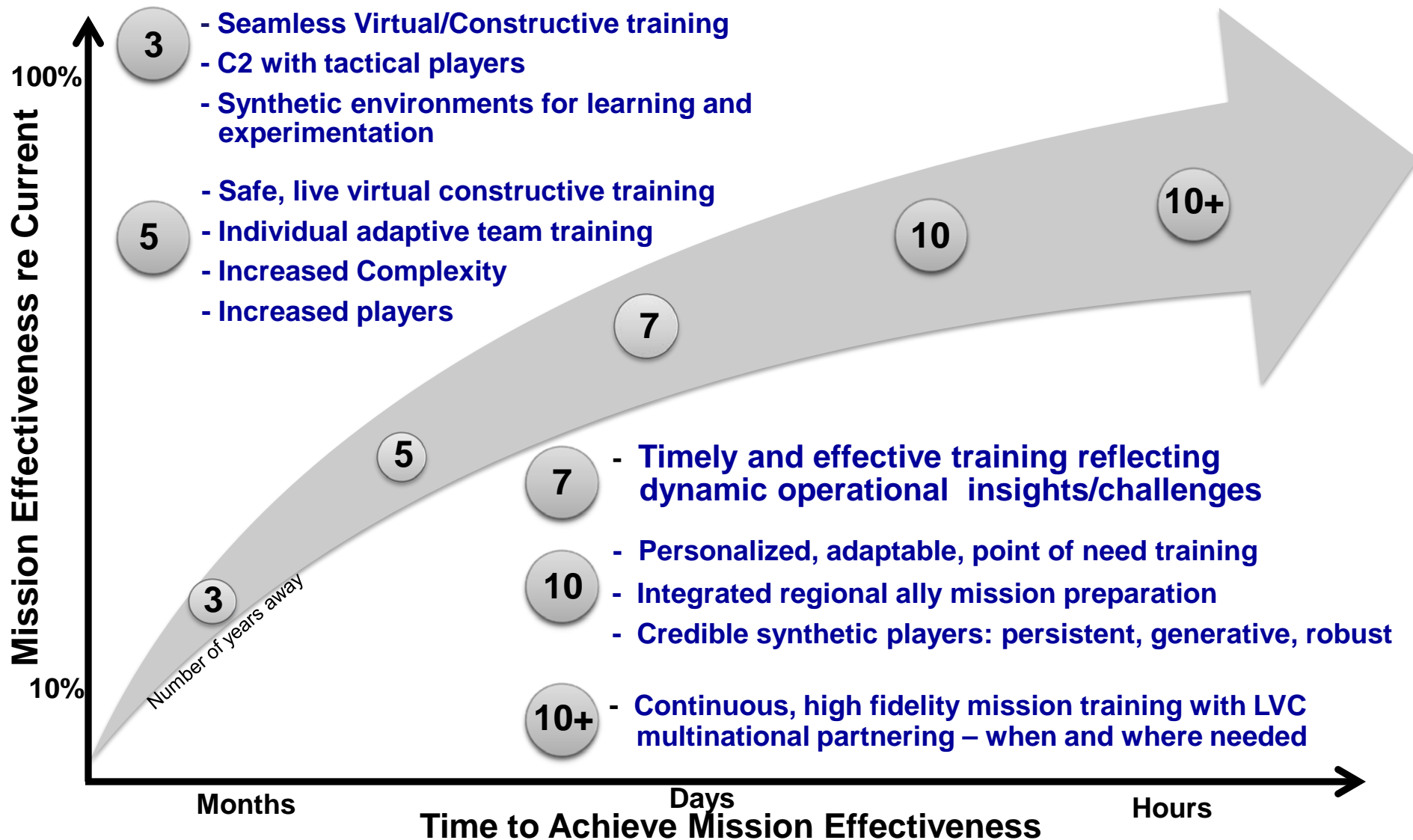
Problem: Complex Evolving Threats Outpace Readiness Training

- Warriors train for tomorrow's fight using yesterday's technology, methods, and strategies
- Current training scenarios not matched to evolving mission complexity and dynamics
- Warfighters are trained to doctrine -- fight strategically and dynamically to meet new threats
- Training is costly
 - Live systems deplete inventory, consume fuel, require maintenance & wear out
 - Ranges & role players are expensive – lack responsiveness to changing scenarios
 - Training ranges not designed for flexible training and throughput is inadequate





Training Technology End States





Human Systems Training Technical Challenges



Challenge 1: First Principles for Training Design

- Synthetic environments for experimentation and learning
- Techniques to automatically capture operationally relevant measures of performance
- Validated tools to optimize training outcomes across individuals and teams

Challenge 2: Realistic, Adaptive and Interactive Scenario Based Training

- Persistent integration of real world events and content into scenarios and syllabi
- Demonstrated and validated for the full range of warfighter capabilities reflecting recent lessons learned
- Training that adapts to individual needs of warfighters in near real-time
- Trading realism for flexibility

Challenge 3: Persistent, Affordable, Integrated Training

- Mission-focused training simulations that support individual and collective training
- Seamless, secure integration of training systems across services and coalition partners



Human Systems Training - Measures of Success



Challenge 1: First Principles for Training Design

- Calibrating training to mission effectiveness
- Automated feedback for unit performance mission training scenarios

Challenge 2: Realistic, Adaptive and Interactive Scenario Based Training

- Automatic players in training scenarios indistinguishable from live players ('Turing Test')
- Improved performance resulting from training that automatically adapts in near real time
- 25% reduction in time and cost to develop training scenarios

Challenge 3: Persistent, Affordable, Integrated Training

- Capability to author once and deliver training to any internet-capable device
- Affordable, turnkey capability to link simulations across services for joint training exercises.



Human Systems Interface for Effectiveness



Problem: Current system operation is rigidly data-centric vice flexibly information-centric

- Modern technologies exacerbate critical manning and talent pool deficiencies by ignoring role of Mission, Task & Context – Moving & presenting data vice information
- Current adaptive planning tools do not allow rapid “course of action” analysis and generation
- Information displays typically non-interactive, adapting little to changing needs
- Data quantity will continue to increase nonlinearly



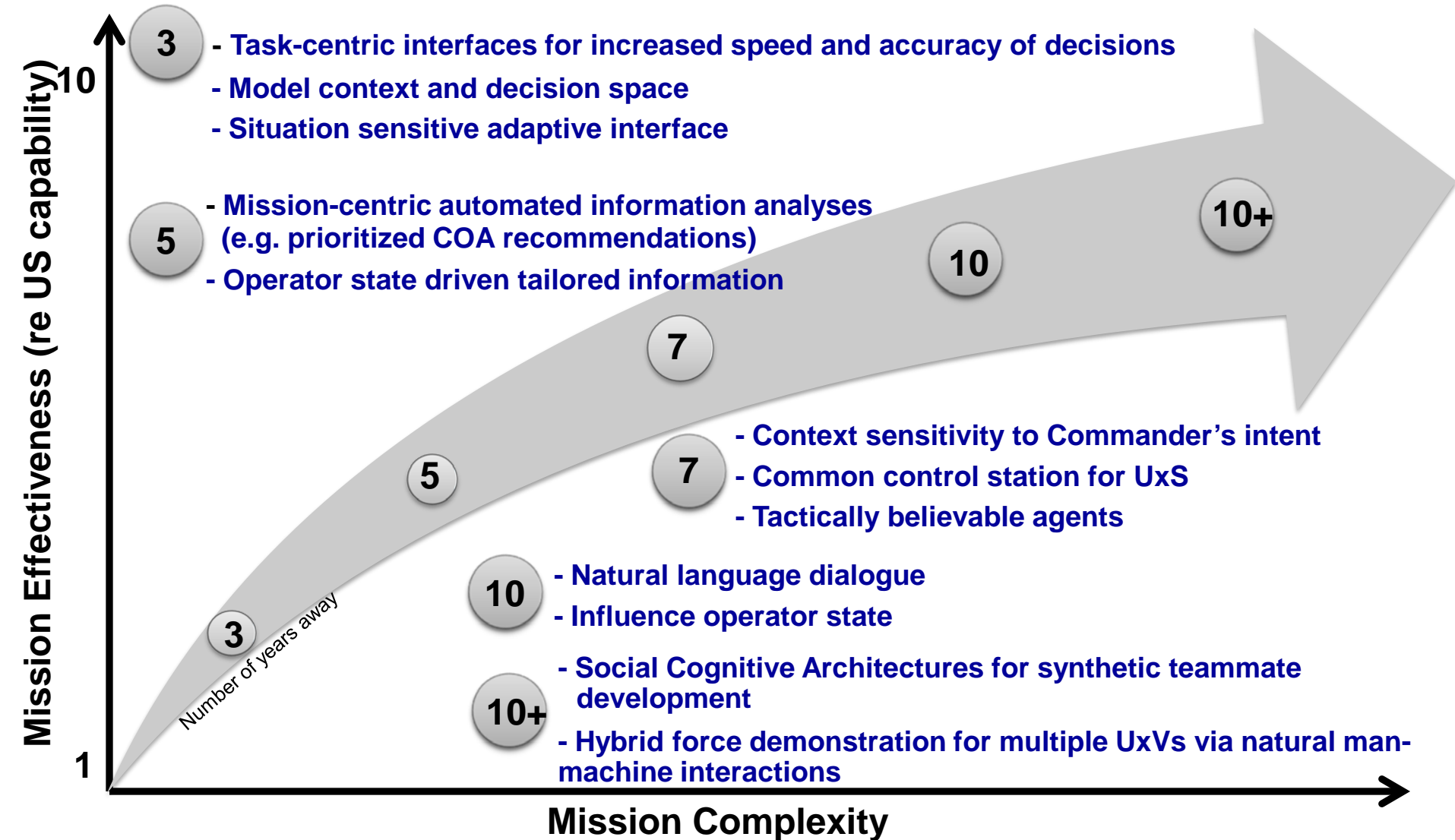
Virtual lab



Actual lab



Interfaces Technology End States





Human Systems Interface Challenges



Challenge 1: Human-Machine Teaming

- Robots that can participate in realistic dialogue with the operator
- Domain-agnostic performance metrics for human-machine interactions

Challenge 2: Intelligent, Adaptive Aiding

- Adaptive determination of relevant data for human-machine interaction
- Platform-independent frameworks to capture cognitive concepts of rich user models: beliefs, desires, intentions, obligations, and goals

Challenge 3: Intuitive Interaction

- High fidelity operator state modeling with information from rich user models
- Coordinated command and control of hybrid forces



Human Systems Interface - Measures of Success



Challenge 1: Human-Machine Teaming

- Number of agents controlled by single operator ($x \rightarrow 10x$)
- Percent of warfighters serviced
- Percent of operator requests anticipated to criterion ($0\% \rightarrow 90\%$)
- Latency for machine-generated alternative courses of action ($2T \rightarrow \frac{1}{2}T$)

Challenge 2: Intelligent, Adaptive Aiding

- Speed and accuracy of decisions x scope (search time = 0)
- Transaction efficiency = ratio of relevant/irrelevant data
- Increased situation salience

Challenge 3: Intuitive Interaction

- Accuracy of operator state assessment for information optimization
- Effectiveness of natural dialogue (transaction efficiency)
- Ease of interaction, time to achieve full competency



Human Systems Broad Agency Announcements



USAF

- BAA 09-05-RH - Science and Technology For Warfighter Training and Aiding
 - POC: Dr. Winston Bennett
- BAA 09-04-RH - Warfighter Interface Technologies Advanced Research Programs (WITARP)
 - POC: Mr. Randy Yates
- BAA 09-02-RH - Advances in Bioscience for Airmen Performance
 - POC: Mr. Mark Fagan
- BAA 09-03-RH - Research & Analytical Support for the 711th HPW Human Effectiveness Directorate
 - POC: Ms. Linda Lange
- BAA-AFOSR-2011-01 Research Interests of the Air Force Office of Scientific Research
 - POC: Dr. Hugh DeLong

Navy

- ONR BAA 11-031 - Office of Naval Research (ONR)
 - POC: Dr. William Krebs
- ONR BAA 12-001 - Office of Naval Research (ONR) Long Range BAA
 - POC: Dr. William Krebs



Human Systems Broad Agency Announcements



Army

- 11 - 13 Natick BAA Broad Agency Announcement (BAA) For Basic and Applied Research
 - POC: Multiple
- W5J9CQ-11-R-0017 U.S. Army Research Institute (ARI) for the Behavioral and Social Sciences
 - POC: Jim Belanich
- W5J9CQ-12-R-0002 - United States Army Research Institute for the Behavioral & Social Sciences
 - POC: Dr. Jay Goodwin
- W911NF-07-R-0003-04 - Army Research Office – Broad Agency Announcement for Basic and Applied Scientific Research
 - POC: Dr. Robert Ulman
- W91CRB-08-R-0073 - Research, Development and Engineering Command – Simulation and Training Technology Center
 - POC: Dr. Frank Tucker
- W911NF-07-R-0001-05 – Army Research Laboratory and the Army Research Office Broad Agency Announcement for Basic and Applied Research
 - POC: Dr. Tomasz Letowski



Summary



- **Evolving threats outpace contemporary readiness training**
- **Interfaces are not operator/information-centric**
- **Training Goals**
 - Synthetic environments for mission training
 - Continuous, real-time training with LVC multinational partnering
 - Seamless, secure integration of training systems across services
- **Interface Goals**
 - Frameworks that capture the intentions & obligations of the operator
 - Integrated data based on operators' modeling of natural language & gestures
 - Human-machine teaming based on immediate feedback and accurate predictions of operators' mental states via interactions